

## Dietary Supplement Fact Sheet

### Magnesium

Magnesium is needed for more than 300 biochemical reactions in the body. It helps maintain normal muscle and nerve function, keeps heart rhythm steady, supports a healthy immune system, and keeps bones strong. Magnesium also helps regulate blood sugar levels, promotes normal blood pressure, and is known to be involved in energy metabolism and protein synthesis [2-3]. There is an increased interest in the role of magnesium in preventing and managing disorders such as hypertension, cardiovascular disease, and diabetes. Dietary magnesium is absorbed in the small intestines. Magnesium is excreted through the kidneys [1-3,4].

### What foods provide magnesium?

Green vegetables such as spinach are good sources of magnesium because the center of the chlorophyll molecule (which gives green vegetables their color) contains magnesium. Some legumes (beans and peas), nuts and seeds, and whole, unrefined grains are also good sources of magnesium [5]. Refined grains are generally low in magnesium [4-5]. When white flour is refined and processed, the magnesium-rich germ and bran are removed. Bread made from whole grain wheat flour provides more magnesium than bread made from white refined flour. Tap water can be a source of magnesium, but the amount varies according to the water supply. Water that naturally contains more minerals is described as "hard". "Hard" water contains more magnesium than "soft" water. Eating a wide variety of legumes, nuts, whole grains, and vegetables will help you meet your daily dietary need for magnesium. Selected food sources of magnesium are listed in Table 1. **Table 1: Selected food sources of magnesium [5]**

FOOD	Milligrams (mg)	%DV*
Halibut, cooked, 3 ounces	90	20
Almonds, dry roasted, 1 ounce	80	20
Cashews, dry roasted, 1 ounce	75	20
Soybeans, mature, cooked, ½ cup	75	20
Spinach, frozen, cooked, ½ cup	75	20
Nuts, mixed, dry roasted, 1 ounce	65	15
Cereal, shredded wheat, 2 rectangular biscuits	55	15
Oatmeal, instant, fortified, prepared w/ water, 1 cup	55	15
Potato, baked w/ skin, 1 medium	50	15

Peanuts, dry roasted, 1 ounce	50	15
Peanut butter, smooth, 2 Tablespoons	50	15
Wheat Bran, crude, 2 Tablespoons	45	10
Blackeye Peas, cooked, ½ cup	45	10
Yogurt, plain, skim milk, 8 fluid ounces	45	10
Bran Flakes, ¾ cup	40	10
Vegetarian Baked Beans, ½ cup	40	10
Rice, brown, long-grained, cooked, ½ cup	40	10
Lentils, mature seeds, cooked, ½ cup	35	8
Avocado, California, ½ cup pureed	35	8
Kidney Beans, canned, ½ cup	35	8
Pinto Beans, cooked, ½ cup	35	8
Wheat Germ, crude, 2 Tablespoons	35	8
Chocolate milk, 1 cup	33	8
Banana, raw, 1 medium	30	8
Milk Chocolate candy bar, 1.5 ounce bar	28	8
Milk, reduced fat (2%) or fat free, 1 cup	27	8
Bread, whole wheat, commercially prepared, 1 slice	25	6
Raisins, seedless, ¼ cup packed	25	6
Whole Milk, 1 cup	24	6
Chocolate Pudding, 4 ounce ready-to-eat portion	24	6

\*DV = Daily Value. DVs are reference numbers developed by the Food and Drug Administration (FDA) to help consumers determine if a food contains a lot or a little of a specific nutrient. The DV for magnesium is 400 milligrams (mg). Most food labels do not list a food's magnesium content. The percent DV (%DV) listed on the table above indicates the percentage of the DV provided in one serving. A food providing 5% of the DV or less per serving is a low source while a food that provides 10-19% of the DV is a good source. A food that provides 20% or more of the DV is high in that nutrient. It is important to remember that foods that provide lower percentages of the DV also contribute to a healthful diet. For foods not listed in this table, please refer to the U.S. Department of Agriculture's Nutrient Database Web site: [http://www.nal.usda.gov/fnic/cgi-bin/nut\\_search.pl](http://www.nal.usda.gov/fnic/cgi-bin/nut_search.pl).

**Table 2: Recommended Dietary Allowances for magnesium for children and adults [4]**

Age (years)	Male (mg/day)	Female (mg/day)	Pregnancy (mg/day)	Lactation (mg/day)
1-3	80	80	N/A	N/A
4-8	130	130	N/A	N/A
9-13	240	240	N/A	N/A
14-18	410	360	400	360
19-30	400	310	350	310
31+	420	320	360	320

### **When can magnesium deficiency occur?**

Even though dietary surveys suggest that many Americans do not consume recommended amounts of magnesium, symptoms of magnesium deficiency are rarely seen in the US. However, there is concern about the prevalence of sub-optimal magnesium stores in the body. For many people, dietary intake may not be high enough to promote an optimal magnesium status, which may be protective against disorders such as cardiovascular disease and immune dysfunction [7-8].

**Magnesium and blood pressure** "Epidemiologic evidence suggests that magnesium may play an important role in regulating blood pressure [4]." Diets that provide plenty of fruits and vegetables, which are good sources of potassium and magnesium, are consistently associated with lower blood pressure [31-33]. The DASH study (Dietary Approaches to Stop Hypertension), a human clinical trial, suggested that high blood pressure could be significantly lowered by a diet that emphasizes fruits, vegetables, and low fat dairy foods. Such a diet will be high in magnesium, potassium, and calcium, and low in sodium and fat [34-36].

**Magnesium and diabetes** Diabetes is a disease resulting in insufficient production and/or inefficient use of insulin. Insulin is a hormone made by the pancreas. Insulin helps convert sugar and starches in food into energy to sustain life. There are two types of diabetes: type 1 and type 2. Type 1 diabetes is most often diagnosed in children and adolescents, and results from the body's inability to make insulin. Type 2 diabetes, which is sometimes referred to as adult-onset diabetes, is the most common form of diabetes. It is usually seen in adults and is most often associated with an inability to use the insulin made by the pancreas. Obesity is a risk factor for developing type 2 diabetes. In recent years, rates of type 2 diabetes have increased along with the rising rates of obesity.

Magnesium plays an important role in carbohydrate metabolism. It may influence the release and activity of insulin, the hormone that helps control blood glucose (sugar) levels [13]. Low blood levels of magnesium (hypomagnesemia) are frequently seen in individuals with type 2 diabetes. Hypomagnesemia may worsen insulin resistance, a condition that often precedes diabetes, or may be a consequence of insulin resistance. Individuals with insulin resistance do not use insulin efficiently and require greater

amounts of insulin to maintain blood sugar within normal levels. The kidneys possibly lose their ability to retain magnesium during periods of severe hyperglycemia (significantly elevated blood glucose). The increased loss of magnesium in urine may then result in lower blood levels of magnesium [4]. In older adults, correcting magnesium depletion may improve insulin response and action [42].

**Magnesium and cardiovascular disease** Magnesium metabolism is very important to insulin sensitivity and blood pressure regulation, and magnesium deficiency is common in individuals with diabetes. The observed associations between magnesium metabolism, diabetes, and high blood pressure increase the likelihood that magnesium metabolism may influence cardiovascular disease [49]. Some observational surveys have associated higher blood levels of magnesium with lower risk of coronary heart disease [50-51]. In addition, some dietary surveys have suggested that a higher magnesium intake may reduce the risk of having a stroke [52]. There is also evidence that low body stores of magnesium increase the risk of abnormal heart rhythms, which may increase the risk of complications after a heart attack [4]. These studies suggest that consuming recommended amounts of magnesium may be beneficial to the cardiovascular system. They have also prompted interest in clinical trials to determine the effect of magnesium supplements on cardiovascular disease.

**Magnesium and osteoporosis** Bone health is supported by many factors, most notably calcium and vitamin D. However, some evidence suggests that magnesium deficiency may be an additional risk factor for postmenopausal osteoporosis [4]. This may be due to the fact that magnesium deficiency alters calcium metabolism and the hormones that regulate calcium (20). Several human studies have suggested that magnesium supplementation may improve bone mineral density [4]. In a study of older adults, a greater magnesium intake maintained bone mineral density to a greater degree than a lower magnesium intake [56]. Diets that provide recommended levels of magnesium are beneficial for bone health, but further investigation on the role of magnesium in bone metabolism and osteoporosis is needed.

**Table 5: Tolerable Upper Intake Levels for supplemental magnesium for children and adults [4]**

Age (years)	Male (mg/day)	Female (mg/day)	Pregnancy (mg/day)	Lactation (mg/day)
Infants	Undetermined	Undetermined	N/A	N/A
1-3	65	65	N/A	N/A
4 - 8	110	110	N/A	N/A
9 - 18	350	350	350	350
19+	350	350	350	350

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